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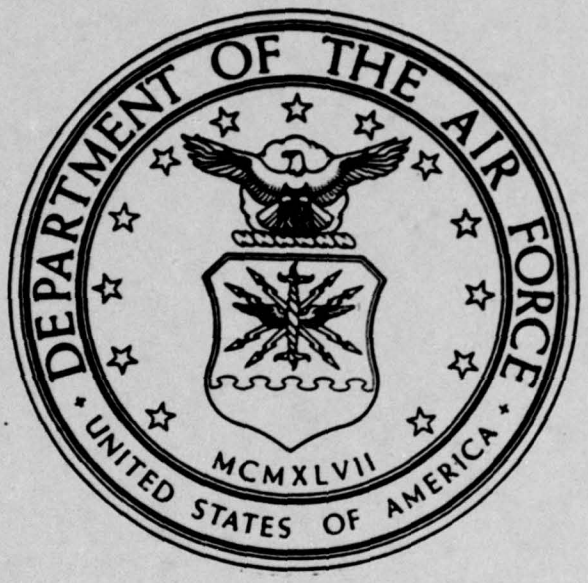

AN ANALYSIS OF THE FUTURE EFFECTIVENESS OF THE SEA BASED DETERRENT

BY
JOHN J. KELLY, JR., MAJOR, USAF

A RESEARCH STUDY SUBMITTED TO THE AIR FORCE FACULTY

May 1979

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Evaluate the deterrent capability of Trident submarine and analyze capabilities against anti-submarine warfare.

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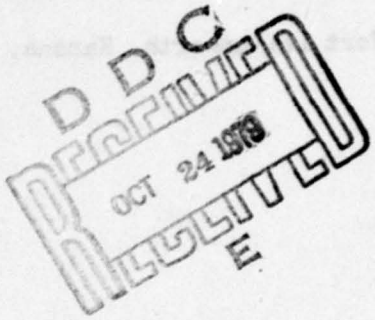

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EXECUTIVE SUMMARY

TITLE: AN ANALYSIS OF THE FUTURE EFFECTIVENESS OF THE SEA BASED DETERRENT

AUTHOR: MAJOR JOHN J. KELLY, JR.

ADVISOR: MAJOR JOSEPH F. MATHIS

I. Purpose: To evaluate the deterrent capability of the Trident submarine and to analyse the capability of the Trident submarine against the most probable anti-submarine warfare strategies.

II. Problem: The cancellation of the B-1 bomber program, the projected vulnerability of the Minuteman force and continued delays on a basing decision for the MX missile are three factors which have caused DOD to place increased reliance on the sea based leg of the Triad. The Trident submarine, together with the Trident I missile, is presently programmed to replace the existing fleet of Polaris and Poseidon submarines. Engineering development is continuing on the Trident II missile as an option to replace the Trident I missile. The financial expense of the Trident program will only be justified if it preserves the existing advantages of the ballistic missile submarine and if it also remains invulnerable to future anti-submarine warfare capabilities and strategies.

III. Data: An analysis of present and projected ICBM force levels and capabilities reveals a significant advantage to the U.S.S.R. in total warheads throwweight and yield and raises doubt over the ability of the ICBM force to survive a Soviet preemptive strike. To counter this

imbalance, the Trident submarine program offers the earliest deployment date of any of the proposed major improvement programs for the strategic offensive forces. The retrofit of the 12 newest Poseidon submarines with the Trident I missile, together with the deployment of 10 Trident submarines, provides for the retirement on schedule of the 41 ships of the Polaris and Poseidon fleet. The Trident I missile will offer a 4,000 mile range capability (6,000 mile range for Trident II) as opposed to the 2,500 mile range of the Poseidon missile. Present and projected Soviet anti-submarine warfare capabilities indicate the continued survivability of the sea based deterrent.

IV. Conclusions: The Trident program preserves all the current advantages of the ballistic missile submarine and offers significant improvements in capability and survivability. Payload and yield capabilities will increase while the Trident II missile may provide a hard target kill capability. The increased missile range offers a 300% increase in available oceanic patrol areas for the Trident I (100% increase for the Trident II missile). This increase complicates the scope and complexity of an adversary's anti-submarine warfare program. The increased missile range can also be used to counter the four major strategic anti-submarine warfare strategies available to an adversary.

V. Recommendations: The Trident submarine and Trident I missile program is a credible deterrent and should be funded at presently programmed levels. Engineering development and testing should continue on the Trident II missile to allow for a future retrofit.

LIST OF FIGURES

CHAPTER I

THE STRATEGIC SETTING

Since the introduction of the first Fleet Ballistic Missile (FBM) Submarine in 1960, the Triad has remained the cornerstone of U. S. nuclear deterrent strategy. However, over the past seven years, several distinct yet interrelated events have had the cumulative effect of precipitating major national policy debates regarding our nuclear deterrent strategy and the size, composition, and resultant cost of each leg of the Triad.

This paper will examine the credibility and effectiveness of the sea leg of the Triad. It will then analyse the effects of the Trident modernization program upon our strategic policy and upon the projected strategic balance with the U. S. S. R. A discussion of current and future Anti-submarine Warfare (ASW) capabilities and possible tactics against the FBM fleet is presented.

When the SALT accords were signed in 1972, the U. S. had recently completed a major modification program on each of the three legs of the Triad. The B-52 had been modified to carry the Short Range Attack Missile to provide the bomber with a stand-off capability against Russian defenses, thereby improving both survivability and the ability to destroy required targets. The Poseidon C-3 missile had become operational in 1971, providing the FBM force with an improved missile equipped with Multiple, Independently Targetable Reentry Vehicles (MIRV's). The ICBM leg of the Triad was also in the process of modernization with the program to replace Minuteman I with the Minuteman III MIRV'd missile near completion. In addition to these efforts, the B-1

bomber and the Undersea Long Range Missile System (ULMS-1) were both in the initial development stage.

Possessing a monopoly in MIRV technology and having just completed these modernization programs, the United States entered the SALT negotiations with the premise that our advantages in missile accuracy, MIRV technology, and Triad flexibility would offset any advantages the U. S. S. R. could gain from a greater number of total missile launchers and higher payload capabilities. As a result, SALT I allowed the U. S. to deploy a total of 1054 ICBM's vs. 1607 for the U. S. S. R. The limits for SLBMs were established at 710 for the U. S. vs. 950 for the U. S. S. R. Any increase in SLBM totals above this figure was allowable only if accompanied by corresponding reduction of ICBM launchers. (18:21,26)

Since the SALT agreement was ratified in 1972, the U. S. has completed the deployment of Minuteman III and the Poseidon conversion program. The avionics package of the B-52 has also been updated to provide this aircraft, which was designed for high altitude bombing, an improved low-level penetration ability. Meanwhile, the Soviet Union, possessing a missile force of greater inherently designed throw-weight and allowed more total launchers under SALT I, have pursued a major modernization program for their strategic forces.

Since the ratification of SALT I, the Soviet Union has introduced the Backfire bomber, which provides a one-way unrefueled strike capability against the United States and has also

conducted major modernizations to their ICBM and SLBM force. The SLBM force has grown in numbers from 740 launchers in 1972 to a total of almost 950 launchers in July, 1978. (11:122) They have deployed a modified SS-N-6 SLBM with a Multiple Reentry Vehicle and the SS-N-8 SLBM. A comparison of present U. S. and Soviet Union SLBM forces is shown in Table I. As evidence of the continued priority placed upon the SLBM program, the U. S. S. R. has also flight tested two new SLBM's (SS-NX-17 and SS-NX-18), which are solid propellant missiles with MIRV warheads. (18:28)

The Soviet Union has also deployed three new ICBM systems (SS-17, SS-18, SS-19). These new missiles all carry MIRV payloads, provide improved accuracy and possess a large advantage in throw weight relative to the Minuteman force. Table II presents a comparison of the current U. S. and U. S. S. R. ICBM force capabilities. It is significant that the Soviets have maintained their large per missile payload advantages over the U. S. while deploying this new generation of missiles with improved accuracy and MIRV'd warheads. The Soviets, through their modernization program, and under the criteria established by SALT I, will possess a projected 8.89:1 advantage over the U. S. in total ICBM yield and a 4.87:1 advantage in throwweight by 1985. A tabular projection of the comparative ICBM capability in 1985 is shown in Table III.

Since the hardened ICBM silos are in a fixed and known location, an adversary's problem in destroying a silo is

U. S. and U. S. S. R. SLBM FORCES

(OPERATIONAL or UNDER DEVELOPMENT as of JULY 1978)

MISSILE	RANGE	NUMBER OF MIRV's	PER SUBMARINE NUMBER OF MISSILES	ACCURACY FT	YIELD PER MIRV
Polaris A-3T	2500 NM	3 (MRV)	16	3040	200 KT
Poseidon C-3	2500 NM	10	16	1824	40 KT
Trident I C-4	4000 NM	8	24	1500	100 KT
Trident II D-5	6000 NM	14 (MARVs)	24	MARV	150 KT
SS-N-6(MOD 3)	1390 NM	3(MRV)	16(Yankee)	4300	1 MT(TOT.for 3MRV)
SS-N-8	4168	1	12(Delta I) 16(Delta II)	4900	1 MT
SS-N-18	5000	3	12(Delta II)	?	2 MT

TABLE I

SOURCES:

1. Air Force Magazine, Dec 78, pp.64,122
2. Aviation Week, 18 Apr 77, pp. 16-19

US/USSR ICBM CAPABILITIES

(AS OF JULY 1978)

SYSTEM	PAYLOAD	NUMBER OF MIRVs	ACCURACY (FT)	YIELD PER MIRV
Minuteman II	1,600 lbs	1[1]	1,800[3]	1.0 MT[1]
Minuteman III	2,200 lbs[3]	3	1,200[1]	150 KT[2]
Titan	7,500 lbs[3]	1[4]	3,000[1]	5-10 MT[4]
SS-11 Mod 1	2,000 LBS[4]	1	4,200[1]	2 MT[4]
Mod 3	2,000 lbs[4]	3(MRV)[4]		100-300 KT[4]
SS-17 Mod 1	7,500 lbs	4[1] 1[4]	1,800[1]	900 KT[4]
Mod 2				5 MT[4]
SS-18 Mod 1	16,000[2] lbs	1[4]	1,500[1]	18-25 MT[4]
Mod 2		8/10[4]	1,500	2 MT[4]
SS-19 Mod 1	7,500 lbs	6[4]	1,500	1-2 MT[4]
Mod 2		1		5 MT[4]

SOURCE:

1. Aviation Week, 18 Apr 77, pp 16-19.
2. Aviation Week, 3 Apr 78, pp 14-16.
3. Aviation Week, 5 Dec 77, pp 12-14
4. Air Force Magazine, Dec 78, pp 122-123.
5. Aviation Week, 24 Apr 78, pp 16-19.

TABLE II

1982 PROJECTION FOR ICBM THROWWEIGHT, YIELD AND ACCURACY

MISSILE	# OF MISSILES (MIRVS/MISSILE)	TOTAL WARHEADS	THROWWEIGHT PER MISSILE(LBS)	TOTAL THROWWEIGHT LBS	CEP(FT)	TOTAL MEGATONNAGE
SS-17	200 (4)	800	7,500	1,500,000	1800	720
SS-18	308 (10)	3080	16,000	4,928,000	1500	6160
SS-19	312 (6)	1872	7,500	2,340,000	1500	2808
SS-11	400	1200	6,500	2,600,000	3500	2400
	1220(820 MIRV)	6952		11,368,000		12088
Titan	54 (1)	54	7,500	405,000	3000	405
Minuteman II	450 (1)	450	1,600	720,000	1800	675
Minuteman III	550 (3)	1,650	2,200	1,210,000	1200	280
	1054	2,154		2,335,000		1360

COMPARISONS

Warheads: 3.23 to 1 Advantage to U. S. S. R.
Throwweight: 4.87 to 1 Advantage to U. S. S. R.
Yield: 8.89 to 1 Advantage to U. S. S. R.

Note:
1. Based on average yield of 1.5 MT for SS-19.
2. Assumes partial retention of SS-11 to reach SALT II limits for total ICBM launchers.

SOURCE

1. Aviation Week and Space Technology, 5 Dec 1977, pp 12-15.
2. Air Force Magazine, Dec 1978, pp 122.
3. U. S. Military Posture Statement, pp 22.
4. Air Force Magazine, March 1979, p 49.

TABLE III

basically reduced to two variables; namely, possessing sufficient weapon yield and increasing the accuracy to a point where the weapon's blast effects can overcome the target hardness. (19:63) This combination of accuracy and high throwweight/yield has enabled the Soviet ICBM force to become a creditable and alarming threat to the U. S. ICBM force. The SS-18, when configured with one 25 MT warhead, offers the most pressing threat to the U. S. ICBM force with a Single Shot Probability of Kill (SSPK) of 98% against a target hardened to a degree comparable to a Minuteman silo. (7:12) By the early part of the next decade, the Soviets will be able to credibly threaten 90% of the U. S. ICBM force with only 1/3 of their ICBMs. Specifically, with a CEP of 0.2 NM (1200 ft), only 240 SS-18s can destroy 720 Minuteman silos or 72% of the total Minuteman force. (17:49) We are now in a position where current force capability projections show an ability for the U. S. S. R. to destroy a major portion of our ICBM force with a preemptive first strike. This destabilizing situation not only degrades our deterrent posture by diminishing our retaliatory capability after a possible Soviet first strike, but the Soviets could also entertain the perception that it would now be advantageous to launch a first strike against our nuclear retaliatory forces. This alarming counterforce capability of the U. S. S. R. was recognized by Defense Secretary Brown when he announced during his annual report to Congress in February 1978 that the main insurance against projected ICBM vulnerability will come from the SLBM and bomber force.

(19:65) Although the Secretary has placed increased reliance on both the air breathing and sea leg of the Triad, the only quantum improvement that can be made in the next 3 years to the strategic deterrent force is the introduction of the Trident I missile (C-4) and the Trident submarine.

In his Congressional testimony, Secretary Brown stated that "our primary measure of strategic capability is our ability to retaliate after a Soviet first strike". (19:103) With this statement serving as a major criteria, and with the Secretary's announced policy to place increased reliance on the FBM force, the following chapters will analyse how and to what degree the FBM force and its projected modernization contributes both to the Triad and also to our deterrent capability.

CHAPTER II

AN ANALYSIS OF THE TRIDENT PROGRAM

The Triad system is based on the maintenance of diverse but complimentary weapon systems that are capable, survivable and versatile. (18:21) The major advantage now offered by the FBM force is its survivability. Due to the submarine's mobility and capability to remain submerged for extended periods, the FBM force is now considered to be the least vulnerable element of the Triad. (21:50) This survivability gives rise, in turn, to another advantage; that of discouraging a preemptive attack, thereby promoting nuclear stability. (21:50) The ability of the FBM force to survive an enemy first strike and then retaliate discourages an enemy attack, and this contributes to our most fundamental defense objective - the deterrence of nuclear war. (19:5) Separate and independent studies conducted by both DOD (18:27) and scientific symposums (1:73) have concluded that the Soviet ASW capability does not now, or in the near term, pose a serious threat to the survivability of the SLBM force.

Aside from the stability and survivability offered by the FBM submarines, other unique advantages exist in this leg of the Triad. Their mobility allows them to attack from any direction, unlike the ICBM forces which are constrained by range limitations to polar trajectories. This ability compounds an enemy's Anti-Ballistic Missile (ABM) problem. Because of forward basing and short range missiles, the FBM

force produces the shortest time-of-flight in the Triad and evables it to strike time-sensitive, priority targets. Dr. S. L. Zerburg, Deputy Under Secretary of Defense has stated in this regard that:

> "There are many targets in the U. S. S. R. that need to be attacked on a short time scale because they represent critical Soviet assets that (are essential for fighting nuclear war) . . . we need to stress . . . our ability to take out time urgent Soviet targets." (13:61)

The FBM force, by virtue of its survivability can also be used as a secure withheld force or as a nuclear reserve for use in a follow-on strike or in the event that post-first strike negotiations would fail. The existence of the FBM force also provides the advantage of minimizing collateral damage resulting from an enemy nuclear strike. A nuclear attack against the forward deployed FBM submarines at sea would not result in collateral damage to U. S. population or industrial centers as would an attack on the ICBM or bomber force. Lastly, the existence of a creditable FBM fleet forces the U. S. S. R. to expend resources on ASW, thereby minimizing their ability to concentrate on a defensive system against any one particular leg of the Triad. Their ASW defensive efforts also divert resources from a possible further increase in Soviet offensive capability.

Together with these advantages, there are also distinct disadvantages of the FBM force. For a particular weapon system, the alert rate may be defined as the percentage of the total

number of weapons, or launchers, that are available for launch at any given point in time. Compared to the ICBM, with an average alert rate in excess of 90%, the SLBM has a relatively low alert rate (less than 50%), and the submarine itself is a vulnerable and attractive target while in port. (21:50) The accuracy of the SLBM is less than the ICBM due to inherent uncertainties over the exact position of the submarine at launch. (11:122) The communication links to the submarine are not hardened and are less survivable than the submarine itself or the ICBM communication links. (22:53)

While not attempting to minimize or overlook these limitations, these disadvantages are recognized and compensated for by the mutually reinforcing characteristics of the Triad and by "hedging" the capabilities of each of the Triad's legs. (13:61) The survivability of the FBM force against present and projected enemy threats make it a credible, effective and vital component of our strategic nuclear forces, particularly in view of the growing vulnerability of the ICBM force.

If it is accepted that the current SLBM force is creditable and effective, then any proposed modernization should either offer an improved capability, be capable of countering a future enemy threat or defensive capability, counter projected obsolescence, or provide a reduction of life cycle costs relative to a nominal level of effectiveness. The balance of this chapter will examine the SLBM modernization program presently proposed by the Defense Department. The analysis will describe the

capability improvements offered, the problem of obsolescence, the associated dollar and opportunity costs, present and projected Soviet ASW strategies and possible counter tactics for the Trident fleet.

The SLBM modernization program proposed by DOD will consist of two stages with the option for a third stage. (19:110,114) During the first stage, the 10 Polaris submarines will be retired from service. The 12 newest Poseidon submarines (Benjamin Franklin class) will be retrofitted with the Trident I, or C-4 missile. This missile will offer an increased range of 4,000 NM, and carry a larger MIRV'd warhead with the increased accuracy. The 19 oldest Poseidon submarines will not be modified and will remain in their present configuration. Finally, during this time period, 12 Trident submarines, each carrying 24 C-4 missiles, will be deployed. The Trident submarine, in addition to its larger missile load, will be a faster and quieter submarine, thereby enhancing its survivability. This stage of the modernization effort should be completed by 1986.

The present force and the force programmed for 1985 is shown in Table IV. The program's second stage consists of the retirement of 31 Poseidon submarines and replacing them with an all-Trident submarine force. By 1992, present programming calls for a total of 504 missiles to be carried in 21 Trident submarines. From this low point, additional submarines may be constructed to increase the total number of SLBM launchers. However, Dr. Brown has stated that even at the lowest level of 504 launchers, the Trident force will possess a capability at least equal to today's submarine force. (19:111)

SLBM FORCE

	Ships	Missiles	Warheads	Yield	Range	CEP
PRESENT						
POLARIS/A-3	10	160	480	200KT	2500NM	3000 FT
POSEIDON/C-3	31	496	4960	50KT	2500NM	1850 FT
	41	656	5440			
1986						
POSEIDON/C-3	19	304	3040	50KT	2500	1850
POSEIDON/C-4	12	192	1536	100KT	4000	1500
TRIDENT/C-4	10	240	1920	100KT	4000	<1500
	41	736	6496			
1992						
TRIDENT/D-5	21	504	7056	150KT	6000	Maneuverable RV

SOURCE

1. Aviation Week and Space Technology, 18 Apr 77, p 16-19.
2. FY 79 DOD Report
3. U. S. Military Posture Statement
4. Air Force Magazine, Dec 78, pp. 64, 122

TABLE IV

The major available option is the replacement of the Trident I (C-4) missile with the Trident II (D-5) missile. This missile, equipped with a maneuverable reentry vehicle, would provide a range of 6000 NM as well as provide accuracy and payload advantages over the C-4 missile. This projected force for the 1992 time frame is also depicted on Table IV. With the modernization program described, the benefits this program offers in relation to the previously established criteria will be examined.

One major advantage of this program is that it provides an alternative to the approaching obsolescence of the present FBM fleet, particularly the 10 Polaris submarines of the George Washington and Ethan Allen classes. The lead ship of these two classes was commissioned in 1959 and 1961, respectively, (2:248) and the ships were designed with only a twenty year service life. (19:112) Under the proposed program, the initial Trident submarine procurement rate and the C-4 missile retrofit rate will allow these 10 oldest boats to be retired at the end of their designed service life, thereby avoiding any possible degradation in performance or the increased maintenance, modification and operating costs normally associated with an extension of operating life.

The 31 ships of the Poseidon FBM force were constructed and made their first deployments between 1962 and 1967 (20:16) and, with their service life already extended to their maximum of 25 years, must be retired between 1987 and 1992. (19:112) However, the 12 Poseidon submarines which will be retrofitted with the Trident I missile will not be retired until the 1991-92

time frame. The proposed modernization program offers three advantages to counter the approaching obsolescence of the 31 Poseidon submarines:

a. Early modification of the 12 newest Poseidon submarines of the Franklin class with the C-4 missile will provide the highest rate of amortization of the modification costs since these boats will be the last of the Poseidon fleet to be retired.

b. As the 19 oldest Poseidon submarines of the Lafayette and Madison class are retired between 1987 and 1989, additional Trident submarines over the initial 12 produced by 1986 will be entering service to replace them.

c. When the last 12 Poseidon submarines of the Franklin class are retired in 1992, the capability represented by the total of 21 Trident submarines produced by that time will insure a continuation of the present SLBM deterrent capability. (19:111)

In summary, the modernization program provides an orderly replacement scheme for both the Polaris and Poseidon submarines, thereby avoiding any costly modification programs designed to increase service life.

The future SLBM force will continue as a credible deterrent force since it preserves virtually all the present advantages of the FBM submarine while adding an imposing array of new or improved capabilities which will now be addressed.

The retrofit of the Poseidon submarine with the C-4 missile will result in a 16% increase in accuracy, 60% increase in launcher payload and, most significantly, a 60% increase in range over the C-3 missile. This range increase, in turn, offers many important operational advantages. First, as shown in Figure I below, it offers 327% more ocean from which the submarine may hide and maneuver and still reach its assigned target, thereby tremendously complicating the scope of Soviet ASW problems.

MISSILE LAUNCH AREAS, WITH MOSCOW AS THE TARGET, AS A FUNCTION OF MISSILE RANGE[1]

Missile	Missile Range (Nautical Miles)	Ocean Area (NM^2)
A-3 and C-3	2500	5.5 Million
C-4 (Trident I)	4000	18.0 Million
D-5 (Trident II)	6000	53.0 Million

Source:
[1]Future of Sea Based Deterrent, p. 66.

This range increase also increases the on-station and alert rate for the SLBM force since the staging time and distance from port to their maneuver area will be reduced. The on-station rate for a Poseidon submarine with C-4 missiles will be increased to 55% as opposed to the 45% presently experienced with the C-3 missile. (2:59) Lastly, this range increase will eliminate the need for overseas basing. These forward bases were required to avoid the lengthy transit time from port to alert area required due to missile range limitations. With the retrofit of the C-4 missile, for example, the extended range will allow the portion of the Poseidon fleet now based at Rota, Spain, to be moved to

Kings Bay, Georgia. This move reduces our dependence on overseas bases and associated costs. (19:112)

The Trident submarine, in addition to possessing the advantages just described for the C-4 missile, will offer several additional advantages. The Trident is designed to operate at a lower noise level than Poseidon, thereby being less vulnerable to passive sonar ASW techniques. It can operate at a higher maximum speed, providing it an increased capability to outrun enemy ASW tracking or trailing efforts. This quieter and faster Trident will thus be more survivable. Also, additional volume is available within the hull for additional sound reduction equipment and for future survivability features. (19:111)

The improved reliability and maintainability designed into the Trident will provide it a 70% on-station rate as contrasted to the 55% for Poseidon/C-4. (2:59) With a 70% on-station rate, the 21 Trident submarines will provide a total of 353 launchers on alert in 1992. To achieve this launcher total today with the Poseidon/Polaris boats, the on-station rate would have to be increased to 54% from the present 45%.

Engineering development is continuing on the Trident II (D-5) missile, and this missile constitutes an available option for strategic force planners. This missile offers a 6,000 NM range, thereby opening up to 10 times the amount of available ocean area from which the SLBM may strike the U. S. S. R. This confronts the Soviet Union with an even greater ASW problem; one that they must then face in every ocean of the world. The greater throwweight of the missile provides a 260% increase in

payload over the C-4 missile and a 525% increase over the present C-3. This throwweight improvement could be used to alleviate the throwweight imbalance that now exists between the U. S. and U. S. S. R. The maneuvering reentry vehicle of the D-5 missile will improve its survivability against any future deployment of a Russian ABM system.

The addition of terminal guidance on this maneuverable reentry vehicle would improve the accuracy of the missile to the point where it would have a true hard target kill capability, should the need arise in the future. Dr. Brown summed up the features of this missile when he stated that,

> "Since the Trident II could provide a capability in terms of payload, range and accuracy against the full range of Soviet targets from a highly survivable platform, it is a valuable option to maintain while deciding the long term overall structure of strategic forces . . We may well wish to exercise that option at the appropriate time." (19:114)

These technological advances and advantages do not come cheaply. The acquisition costs for the first 10 Trident submarines, equipped with the Trident I missile will be, in constant FY 74 dollars, over 13.5 billion dollars (1:34), with 3.25 billion dollars requested in the FY 80 Budget Proposal. (19:128) While a detailed analysis of Trident cost-effectiveness is beyond the scope and purpose of this paper, a few points of caution must be mentioned. First, due to the inherently designed diversity in capability of each leg of the Triad and their mutually supporting and reinforcing nature, it would be difficult and perhaps even dangerous to compare costs relative only to

each leg. If, however, an order of magnitude cost differential arose between the Trident submarine and MX missile, for example, then the requirement for the continuation of the Triad itself should be the issue.

Secondly, the Trident acquisition costs should not be considered in a vacuum, but as part of the life cycle costs of the weapon system. The indirect and direct operating costs should decrease with Trident as the need for forward basing is eliminated. Lastly, it is vital to consider the opportunity costs involved with delaying the program. The MX program is still facing uncertainties over its cost, basing concept, and possible resultant environmental issues. Also, no firm decision has yet been made on the type or number of cruise missile carriers. The Trident missile and submarine program is the only major strategic modernization that can achieve any type of operational status in the next three years. It would be difficult to imagine a Trident cost reduction being achieved by a delay; furthermore, the delay would only aggravate the current throw-weight imbalance with the U. S. S. R. However, the technological advances, operational advantages and costs considerations of this modernization program will all become moot should the U. S. S. R. soon possess or develop a capability which would make the FBM force vulnerable to an ASW campaign, and thereby destroy the SLBM forces' deterrent capability. The concluding section of the analysis will examine the Soviet ASW capability and possible ASW tactics and counter-tactics that could be employed by the Trident force in the future.

CHAPTER III

AN ANALYSIS OF STRATEGIC ANTI SUBMARINE WARFARE

ASW operations may be divided into two relatively distinct areas; tactical and strategic ASW. Tactical ASW operations are conducted to protect convoys, supply ships, an expeditionary force or task force from enemy submarine attack. This type operation may also be conducted to gain sea control over a relatively small oceanic area or to prevent submarine movement through a choke point in order to prevent their access to a larger body of water. (4:35) Strategic ASW is conducted against the enemy's SLBM submarines, and by nature is conducted on an entirely different scale and with different goals. For example, an attack submarine seeks to locate and destroy enemy shipping and sea power, while an SLBM submarine actively attempts to avoid enemy sea forces, and seeks to use the enormity of the ocean for concealment, thereby avoiding choke points, other ships, established sea lanes, or enemy point defenses. (4:38)

Although defense against the FBM submarine is one of the two strategic defensive missions (together with carrier defense) of the modern and rapidly expanding Soviet Navy (16:58), the U. S. S. R. is currently limited - both by equipment and by capability - to a tactical ASW mission, and the U. S. FBM force remains highly survivable. The ASW equipment presently in use by the Soviet Navy is shown in Table V. Their ASW aircraft are small in total number and do not possess the range to effectively patrol the large ocean areas required for strategic

SOVIET ASW STATUS
(AS OF JULY 78)

EQUIPMENT[1]

Submarines

- 40 Nuclear Attack Submarines
- 129 Conv. Attack Submarines (Max Submerged Speed is 16 Knots)

Surface

- 2 Moskva Class, 1 Kiev Class ASW Hel. Cruisers
- 16 Cruisers
- 47 Destroyers

Aircraft

- 220 Helicopters
- 50 IL-38, 90 Be-12 (Passive Sonar Only, Max Surv. Range 1500 km)

CAPABILITIES

- Designed for Surface Shipping Protection and Control of Choke Points
- Limited Range for Strategic ASW Operations
- Attack Submarines Relatively Noisy and Unsuited for Passive Detection or Tracking
- Acoustical Processing Technology Lagging Behind U. S.

SOURCE:

1. AF Magazine, Dec 78, pg 69-70, 120

TABLE V

operations. These same shortcomings are also shared by their surface forces. Their submarine force, although very large in total numbers, operates at higher noise levels than U. S. FBM submarines, thereby minimizing their effectiveness in acoustical tracking or detection. The Soviets, unlike the U. S. Navy, have not yet deployed the Fixed Dispersion Arrays or the Fixed Concentrated Arrays and the associated advanced acoustical processing equipment required for detection and correlation over a large ocean area. (4:30) Mr. W. T. Lee, a former CIA specialist in Soviet military capabilities and now a government consultant, has stated that,

> "Two decades ago Soviet strategic ASW forces couldn't find a U. S. SSBN, and couldn't kill it if they happened upon it. At present, they still can't find U. S. SSBNs, but could kill some of them if they did." (16:58)

Although the Soviets do not now pose a serious threat to the SLBM force, and none seems likely for the next decade (2:73), a Soviet breakthrough in the ASW technology could limit the effectiveness of the FBM submarine. The House Armed Services Committee has reported that the U. S. S. R. is placing a high priority on developing an ASW capability. This research effort presently involves several highly sophisticated non-acoustical detection methods, in addition to acoustical technology. (15:46)

Although the probability that the Soviets will be able to solve the strategic ASW problem and reliably detect, localize, track for an extended period, and destroy the targets appears small at this time, it would be shortsighted to disregard the rapid pace of technology and its possible effects and applications.

It is necessary to examine the various strategies available to both the U. S. S. R. and the U. S. SLBM force in the worst case situation, whereby the Soviets develop a credible strategic ASW capability, either through acoustical methods or perhaps through satellites or LASER technology.

There are four basic strategies the Soviets could possibly employ in an ASW campaign against U. S. FBM submarines; a pre-emptive first strike against all FBM submarines on station, a damage limiting attack, a slow war of attrition, and, lastly, a series of individual sinkings which are designed to appear accidental and occur over an extended period of time. (4:39)

The purpose of a pre-emptive first strike is to simultaneously destroy all the enemy's SLBMs and thereby eliminate their use from a retaliatory second strike. Even at the projected low point in 1992 of 21 Trident submarines, the projected 70% alert rate would require an adversary to destroy simultaneously 14 Trident submarines. To accomplish this pre-emptive attack, an adversary must totally satisfy all of the following operational requirements:

a. The location of every on-station submarine is securely known, in real time, and continuously updated, probably for an extended period, even as the submarines transit to and from port.

b. The continuous trailing required with this tactic is undetected by the submarine, or if detected, neither the submarine nor friendly forces takes any counter-action.

c. The command and control system can monitor and direct a simultaneous attack on a global basis against the submarines.

d. The enemy possesses weapons that may be targeted on a real time basis with sufficient accuracy and lethability to insure at a very high confidence level a simultaneous kill (within minutes) of all submarines. (2:39)

The probability that any potential enemy would possess, or be allowed to possess, these four requisites for a pre-emptive first strike appear to this writer to be inestimably small.

The damage limiting attack is conducted along similiar lines to the pre-emptive first strike. However, if the attacker does not possess the capability to simultaneously track and destroy all the SLBMs, he will attempt to destroy as many as possible within a relatively short period (an hour or less) in order to minimize the number of missiles available for use in a retaliatory strike. This strategy also requires detection and extended tracking on a global scale with real time targeting of high lethality weapons. It also assumes the submarine force does not take effective counteractions.

The third strategy, the slow war of attrition, may take place over a period of days or weeks, and tactical ASW assets most probably will be brought into use as the adversary, over time, searches out and destroys the FBM force. This strategy also tests the resolve of a nation: is it willing to retialiate after one or even a few of its submarines are sunk and risk

an expanded nuclear war? This combination tactical and strategic ASW operation probably would not be conducted with nuclear weapons, since, in a nuclear war at sea, the surface ASW forces would be far more vulnerable than the submarines.

The fourth possible strategy, and the most unlikely, consists of a series of planned and deliberate "accidental" incidents which occur over a period of months or years. With this strategy, the attacker's goal is the slow attrition of the enemy at no risk to himself and with little liklihood of provoking an armed conflict. An individual FBM submarine will be quickly destroyed without warning by tactical ASW means, and, when the submarine fails to return from patrol, its loss will be charged to accidental causes.

If the Soviets develop the ASW capability to effectively pursue any of these four strategies, the increased missile range and lower operating noise level of the Trident will work in combination to increase the available number of options to counter the ASW threat.

As was previously outlined, the increased missile range will greatly increase the amount of useable ocean for the Trident, thereby increasing the search area for all four types of ASW strategies. The lower noise level makes detection more difficult for all four strategies. It also greatly reduces the probability that the Soviets would be able to passively track the Trident, and remain undetected themselves, which is required for the pre-emptive first strike or damage limiting strategy. However, the missile range offers still another

advantage. If the U. S. perceives that the U. S. S. R. is on the verge of achieving a global strategic ASW capability it can, with the C-4 missile range, then establish the Trident patrol zones along the continental shelves of both the Atlantic and Pacific Ocean and frustrate all four strategies. With the patrol zone along the shelf, the Soviets' difficulties are compounded. First, the ASW problem is inherently more difficult in shallow than in deep water, particularly in areas close to our shores where the Soviets would be unable to deploy acoustical arrays. (2:70) With the Trident force on alert along our shorelines, it would also be necessary, for all four strategies, for the U. S. S. R. to penetrate undetected the current surveillance screens such as our own acoustical arrays and ASW patrols. In periods of increased tensions, U. S. Navy surface ships, attack submarines, and ASW assets could reinforce this screen to further block any U. S. S. R. attack. With the FBM submarines operating inside this screen, the slow war of attrition and resultant test of national resolve is avoided since the ASW forces would be detected before they could attack an FBM submarine. The only tactic then available to the Soviets, assuming they have solved all other variables, would be to use a long range, high yield, highly accurate weapon with either a real time targeting or terminal guidance capability against the Trident fleet. If the U. S. S. R. should develop such a weapon, then the manned bomber force and ICBM force would also be totally vulnerable to a pre-emptive attack by this same type weapon.

Faced with the present ICBM vulnerability arising from SALT I and ambitious Soviet strategic modernization, the SLBM force assumes increased importance. Although faced with approaching FBM submarine obsolesence, a viable and logical modernization program is available which takes advantage of the current survivability of the SLBM force. This program offers the most immediate improvement to our current throwweight imbalance with the U. S. S. R. and also provides increased deployment options to counter future possible U. S. S. R. ASW advances and strategies.

BIBLIOGRAPHY

Books

1. Blechman, Barry M., and Alton H. Quanbeck. Strategic Forces, Issues for the Mid Seventies. Washington: Brookings Institution, 1973.

2. Cahn, Anne H., Bernard T. Field, and Kosta Tsipis. The Future of the Sea-Based Deterrent. Cambridge, Mass: MIT Press, 1973.

3. Johnson, David T., and Barry R. Schneider. Current Issues in U. S. Defense Policy. New York: Praeger Publishers, 1976.

4. Tsipis, Kosta. Tactical and Strategic Antisubmarine Warfare. Cambridge, Mass.: MIT Press, 1974.

Articles and Periodicals

5. Lehman, John F., Jr., "SALT: Asking the Right Question" Air Force Magazine, Vol. 60, No. 5 (May 1977) pp. 28-32.

6. Robinson, Clarence A., Jr. "Strategic Force Structure Faces Stiff Debate", Aviation Week and Space Technology, Vol. 106, No. 16 (18 Apr 1977) pp. 16-19.

7. Robinson, Clarence A., Jr., "MX Deployment Urged for Parity", Aviation Week and Space Technology, Vol. 107, No. 23 (5 Dec 77) pp. 12-14.

8. Robinson, Clarence A., Jr., "Soviets Boost ICBM Accuracy", Aviation Week and Space Technology, Vol. 108, No. 14 (3 Apr 78) pp. 14-16.

9. Robinson, Clarence A., Jr., "SALT Stance Allows New Missiles" Aviation Week and Space Technology, Vol. 108, No. 15 (24 Apr 78), pp. 16-19.

10. "Missile Studies Worry Defense Planners" Aviation Week and Space Technology, Vol. 108, Nov 15 (24 Apr 78) pp. 12-15.

11. Ulsamer, Edgar, "The MX Enigma", Air Force Magazine, Vol 61, No. 12 (Dec 1978) pp. 21-22.

12. The Military Balance, International Institute for Strategic Studies, London, 1978.

13. Ulsamer, Edgar, "Toward A New World Strategy, Air Force Magazine, Vol. 62, No. 1, (Jan 1979) pp. 60-65.

14. Ulsamer, Edgar, "MX Still Zigzagging", Air Force Magazine, Vol. 62, No. 2 (Feb 1979) pp. 14-16.

15. Ulsamer, Edgar, "World Hegemony Through Military Superiority" Air Force Magazine, Vol. 62, No. 3 (Mar 1979) pp. 40-47.

16. Lee, William T., "Soviet Military Policy: Objectives and Capabilities". Air Force Magazine, Vol. 62, No. 3 (Mar 1979) pp. 54-59.

17. Hughes, Peter, "SALT and the Emerging Strategic Threat", Air Force Magazine, Vol. 62, No. 3 (Mar 1979) pp. 48-53.

Official Documents

18. Brown, George S., United States Military Posture for FY 1979. Washington: Government Printing Office, January 1978.

19. Brown, Harold, Department of Defense Annual Report, Fiscal Year 1979. Washington: Government Printing Office, 1978.

20. USN, Strategic Systems Project Office. Polaris and Poseidon: FBM Facts, Washington, D. C., 1973.

21. Rumsfeld, Donald H., Department of Defense Annual Report; FY 77. Washington: Government Printing Office, 1976.

22. Schlesinger, James R. Department of Defense Annual Report; FY 1976 and FY 197T (Washington: Government Printing Office, 1975).